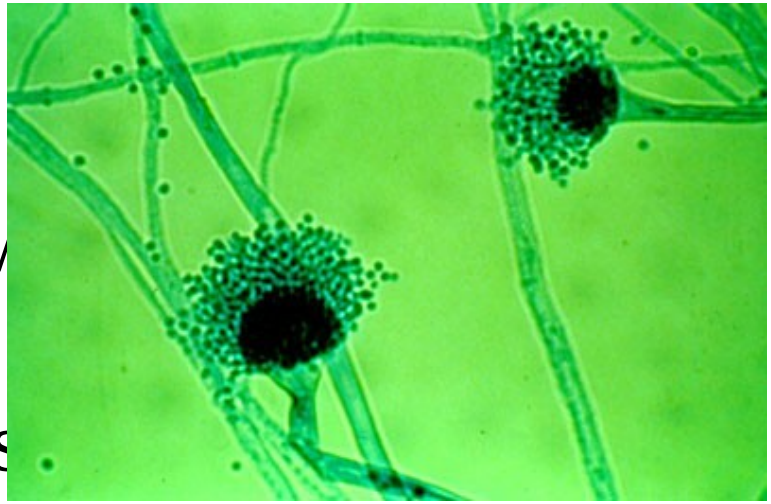
US Army Corps of Engineers ®

# Safety Awareness for responders to Hurricane Operations: Mold Awareness Training

US Army Corps of Engineers ®

# Overview

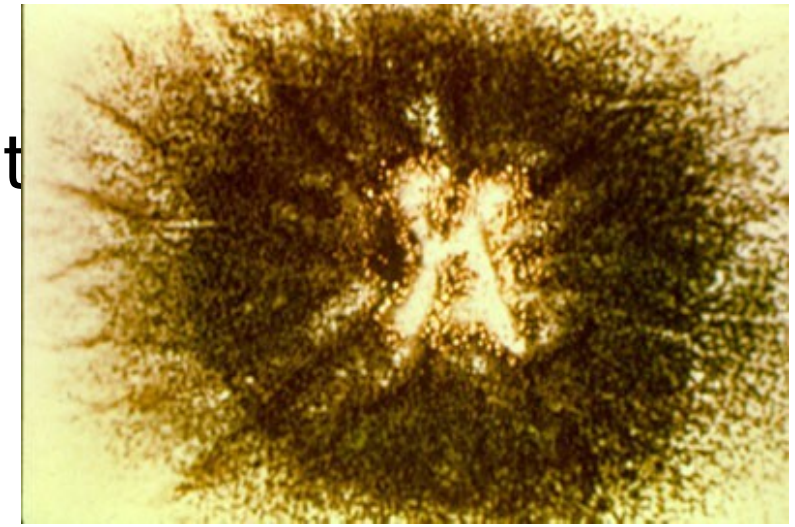
- Introduction to Mold
- Health and mold
- Reasons for mold grov
- Prevention
- Assessment guidelines
- Remediation procedures
- Summary



US Army Corps of Engineers ®

# Objectives of this training - At the end of this short session, you should be able to:

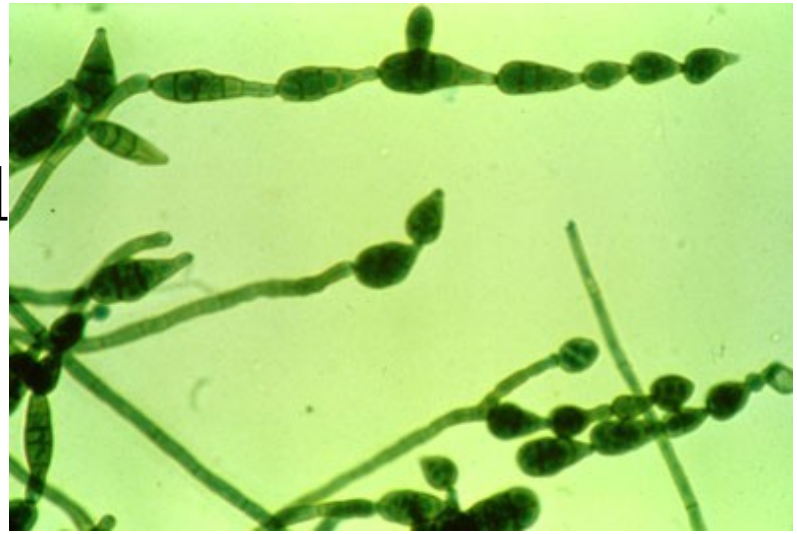
1. Identify the hazards
2. Explain how to protect yourself from these hazards
3. Increase safety and health awareness



US Army Corps of Engineers ®

# Mold Introduction

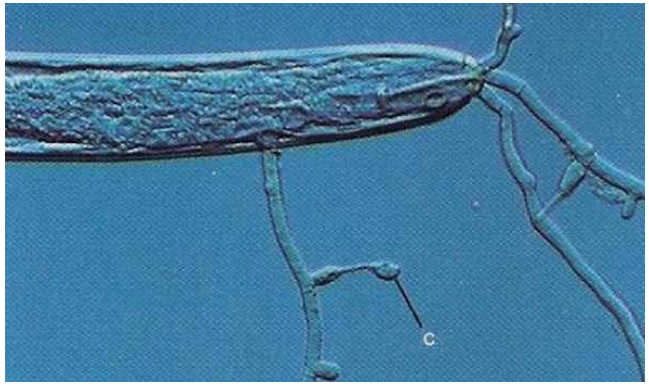
- Mold is everywhere
- Only 3 things needed for mold growth
- Mold will always be here
- Can’t eliminate the first two – the only option is #3 – control moisture



US Army Corps of Engineers ®

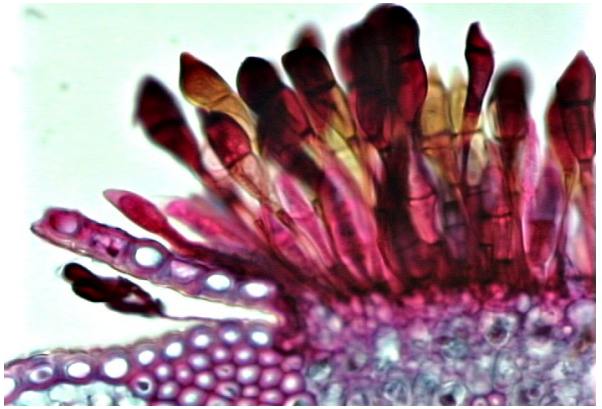
# Mold Verses Fungus

- Fungus is one of the kingdoms (plants, animals)
- Mold is a term of convenience
- All mold is fungus, not all fungus is mold.
- We will use the terms interchangeably



# Fungi

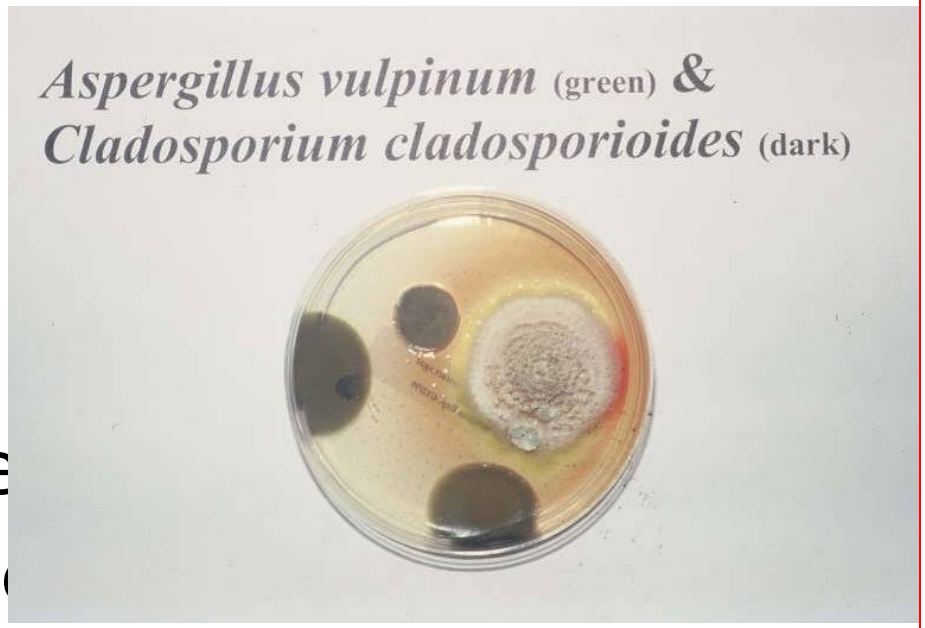
- 80,000 species identified
- Range from mushrooms, molds, yeasts, etc.
- Infect nearly everything!
- Specialized Structures
  - Vegetative
  - Reproductive
- Some are believed to me largest organisms on earth



US Army Corps of Engineers ®

# Mycotoxins

- 200 identified
- Aflatoxin B1
  - Aspergillus
  - Potent Carcinoge
  - Liver / lung canc
- Others impact mucus membranes, nervous system, endocrine effects



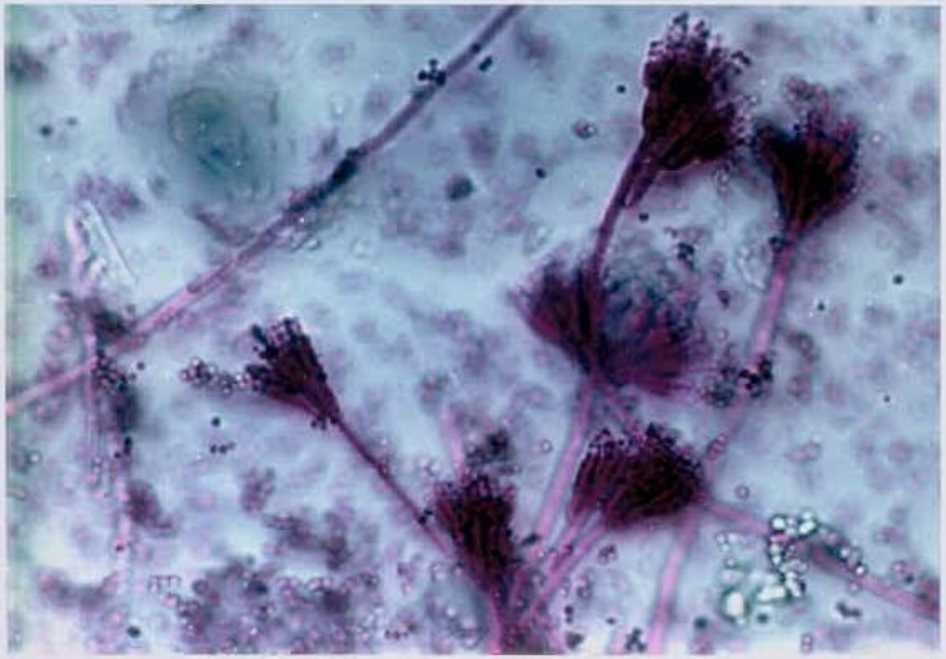
US Army Corps of Engineers ®

# Health and Mold

- Mycotoxins – chemicals produced by some (not all) molds.
  - Some extremely toxic – some therapeutic
  - Most have little or no research on health effects
  - Most human disease due to eating contaminated food or huge agricultural exposures – NOT inhalation

US Army Corps of Engineers ®

## Penicillium Fungi



US Army Corps of Engineers ®

# Health and Mold

- Potential mold reactions depend on:
  - Species involved (there are 1000s of them)
  - Metabolic products of species
  - Duration and intensity of exposure
  - Susceptibility of individual
- Just because mold is present does not create a hazard – it is always there.

US Army Corps of Engineers ®

# Health and Mold

- Allergic reactions – probably the most common response
- Infections – rare (e.g. histoplasmosis). 95% recover naturally. Medical facilities are high risk location.
- Irritation – from chemicals produced by mold.

US Army Corps of Engineers ®

# Health and Mold

Exposure to mold spores and their mycotoxins can lead to a variety of non-specific health problems such as:

- Sinus problems
- Respiratory problems (wheezing, coughing, difficulty breathing)
- Headaches
- Cold and flu-like symptoms (fever, muscle aches, fatigue)
- Sore throats
- Eye irritation
- Frequent bloody noses

US Army Corps of Engineers ®

# Health and Mold

- Toxic Mold - Stachybotrys
  - 1994 – 10 acute pulmonary hemosiderosis in infants in Cleveland – Stachybotrys found in houses
  - 2000 – CDC study - not enough evidence to conclude an association between indoor mold and childrens' condition
  - CDC position on health effects – no consensus

US Army Corps of Engineers ®

# Reasons for Mold Growth

- Primary reason – moisture accumulation
  - Design flaw
  - Construction flaw (e.g. leaky roof, vapor barrier, installation of wet materials)
  - Pipe leak, water overflow
- Growth can start within 48 hrs.

US Army Corps of Engineers ®

# Prevention

- Prevent moisture accumulation
- US EPA study – 45% of office buildings surveyed had active water leaks

US Army Corps of Engineers ®

# Prevention

- Consult envelope engineer on geometrically complex buildings for water tightness
- Document any recommended changes to Architect of Record.
- If recommendation is rejected copy to owner and your file.
- Don’t just “shrug and build it”

US Army Corps of Engineers ®

# Prevention

- Renovations or additions – pre-existing mold survey.
- Prequalify potential subs that they have expertise in specific application
- Consult manufactures of moisture critical products:
  - Fitness for intended service
  - Confirm product's proper application
  - Provide preferred installers

US Army Corps of Engineers ®

# Prevention

- Proper sequencing of work – keep interior materials away from exterior conditions
- Inspect materials at delivery
  - Pre-existing mold
  - Proper moisture content per manufacturer
- Storage
  - Dry location
  - Off the ground
  - Loose tarps or sheets to allow air flow

US Army Corps of Engineers ®

# Prevention

Be sure foundation is dry

- Drain away
- Slope away
- Roof drains properly supported and braced
- Sprinklers will not water the foundation

- Proper insulation on chilled water pipes

US Army Corps of Engineers ®

# Prevention

- Double check points where moisture may enter
  - Doors
  - Windows
  - Flashings and caulking
  - Waterproof membranes (proper lapping at joints and corners
  - Roofing systems and penetrations
  - Balconies and decks

US Army Corps of Engineers ®

# Prevention

- Pre-arrange drying equipment
  - Fans
  - Dehumidifiers
  - Wet-dry vacs

US Army Corps of Engineers ®

# Prevention

- Dry materials as quickly as possible
- If possible, ventilate wall cavity
- Be sure it is safe to use equipment
  - Electrical
  - Ventilation

US Army Corps of Engineers ®

# Prevention

Hidden moisture during 1993 Mississippi floods.

- Pipe chases/utility tunnels
- Above drop ceilings
- Under carpeting
- Wall cavities

US Army Corps of Engineers ®

# Prevention

- HVAC system
  - No internal lining – bare galvanized sheet metal
  - Cooling coil drip pans
  - Filters – good quality and in place
  - Humidity levels – 30-50% RH

US Army Corps of Engineers ®

# Vinyl wall covering traps water

US Army Corps of Engineers ®

# Prevention - Drywall

- Greenboard – moisture resistant
  - Wax added to gypsum and paper cover
  - More resistant to moisture uptake
  - Cost increase to use greenboard throughout
    1 study – 0.08 – 0.6% increase

- Capillary breaks or moisture barriers between gypsum and masonry materials

US Army Corps of Engineers ®

# Prevention

- Double check all water lines
  - Proper installation
  - Connections leak tight
  - Proper insulation
  - Multiple checkers for leak detection
- HVAC commissioning – actual air flow tests critical

US Army Corps of Engineers ®

US Army Corps of Engineers ®

# Assessment

If you can see or smell mold you have a mold situation.

May not be a health hazard but it must be addressed

US Army Corps of Engineers ®

# Assessment

- Visual inspection is the most important initial step in identifying a possible contamination problem.
- Testing not required for remediation.
- Lots of variables in air monitoring collection and interpretation of results.

US Army Corps of Engineers ®

# Assessment

- Moisture meters
- Mold growth may occur up to 1 meter past high water mark or visual mold
- In addition look for:
  - Earthy, musty odor
  - Discolored plaster, wall board, building materials
  - Suspected water accumulation or intrusion

S E
Bedroom

US Army Corps of Engineers ®

# Assessment – Air Monitoring

- Simultaneous samples collected in
  - Problem area
  - Outdoors
- Compare results

US Army Corps of Engineers ®

# Assessment – Air Sampling

- Look for higher levels indoors, or different molds – suggests amplification source
- Can not prove sources of health complaints
- Can not suggest remediation procedures
- Remember – mold is everywhere.

US Army Corps of Engineers ®

# Assessment – Air Sampling

- What will we learn?
- How and who collects and analyzes samples?
- What criteria to interpret the data?

US Army Corps of Engineers ®

# Remediation

- To conquer mold conquer moisture problems.
- Most important action STOP THE MOISTURE.
- Don’t bother doing anything until the moisture source is eliminated

US Army Corps of Engineers ®

# Decontamination

- Non-porous materials (e.g. glass, brick, plastic)
- Porous materials (e.g. carpet, drywall, cloth)
- EPA and OSHA do not recommend routine use of bleach or other biocide

US Army Corps of Engineers ®

# Decontamination

- Read labels
- Follow directions
- Use PPE
- Don’t be Mr. or Ms. Science and start mixing things.

US Army Corps of Engineers ®

# Decontamination -Drywall

- In some situations – decontaminate and encapsulate
  - Limited mold growth
  - Can access **both** sides of drywall
  - Zinc rich paints can be used to control mold
    - ShieldZ – Zinzer
    - Foster 40/20 – H.B. Fuller

US Army Corps of Engineers ®

# Decontamination

- Ozone generators – not recommended
- UV lights – not recommended

US Army Corps of Engineers ®

# US EPA Guidelines

- Level 1 – Small areas – 10 ft2 (ceiling tile)
- Level 2 – Medium – 10-100 ft2 (one to several wallboard panels)
- Level 3 – Large – over 100 ft2

US Army Corps of Engineers ®

# Respirators

- Level 1 - N95 disposables or better
- Level 2 - Full face with N100 filters
- Level 3 - PAPR with N100 filters
- Remember OSHA Respirator Program

US Army Corps of Engineers ®

# Worker Protective Clothing

- All levels
  - Impervious gloves – mid-forearm
  - Goggles – sealed or indirect vent only
  - Disposable coveralls
  - Hand and face washing station

US Army Corps of Engineers ®

# Containment

- Level 1 – none required
- Level 2 – increasing levels as specified
- Level 3 – under negative pressure similar to asbestos abatement
  - All levels – light water misting – not soaking
  - Lots of professional judgment is needed here

US Army Corps of Engineers ®

# Waste Disposal

- Bag
- Rinse
- Toss – check with local authorities just to be sure. Moldy material is NOT RCRA hazardous waste.

US Army Corps of Engineers ®

# Review

- Mold will always be with us.
- Health effects may be scientifically questionable, but public perception is reality.
- To control mold, control moisture.
- Visual inspection is first step in assessment
- No PEL or TLV for mold.